

What is claimed is:

1. A DNA analysis system for analyzing DNA polymorphism, comprising:

ionization means for generating plural kinds of  
5 multiply-charged ions of a test DNA fragment, where each of them has five or more charges;

mass spectrometric means for performing a mass spectrometry on the multiply-charged ion formed by the ionization means;

10 analyzing-result prediction means that predicts a mass spectrum pattern from the mass spectrometric means in each of two cases, where one is that the test DNA fragment is polymorphic and the other is that the test DNA fragment is not polymorphic, based on both information about the 15 test DNA fragment and information about a polymorphism point;

comparative processing means for comparing a plurality of the mass spectrum patterns predicted by the analyzing-result prediction means with the analyzing 20 results of the test DNA fragment analyzed by the mass spectrometric means to determine a nucleic acid base on the polymorphism point.

2. The DNA analysis system according to claim 1, wherein

25 the analyzing-result prediction means predicts a

mass-to-charge ratio ( $m/z$ ;  $m$  is an ion mass,  $z$  is the number of electric charges) of the plural kinds of multi-charged ions in each of two cases, where one is that the test DNA fragment is polymorphic and the other is that the  
5 test DNA fragment is not polymorphic.

3. The DNA analysis system according to claim 1,  
wherein

the analyzing-result prediction means predicts a mass-to-charge ratio ( $m/z$ ;  $m$  is an ion mass,  $z$  is the number of electric charges) of the plural kinds of multi-charged ions and a distribution of ion intensities in each of two cases, where one is that the test DNA fragment is polymorphic and the other is that the test DNA fragment is not polymorphic.  
10

15 4. The DNA analysis system according to claim 1,  
further comprising:

sampling means for supplying a sample including test DNA fragments to the ionization means at fixed intervals;  
and

20 detecting-output analysis means for subtracting a mass spectrum obtained as an analyzing result with respect to a sample previously measured and modified by weight from a mass spectrum obtained as a detecting-output of the mass spectrometric means, wherein

25 the mass spectrum processed by the detecting-output

analysis means is provided as an analyzing result with respect to the test DNA fragment in the sample.

5. The DNA analysis system according to claim 1,  
wherein

5       the ionization means generates multiply-charged ions of the test DNA fragment by the ionization means using an air atomization.

6. The DNA analysis system according to claim 1,  
wherein a nucleic acid base of a single nucleotide  
10 polymorphism point in the test DNA fragment is specified.

7. The DNA analysis system according to claim 4,  
further comprising:

display means for displaying the occurrence of an emergency when a maximum ion intensity detected by the mass spectrometric means is smaller than a predetermined threshold.

8. The DNA analysis system according to claim 7,  
further comprising:

communication means for sending information about the occurrence of the emergency to a system administrator.

9. The DNA analysis system according to claim 4,  
wherein

the sampling means introduces a standard sample into the ionization means when a maximum ion intensity of the mass spectrum detected by the mass spectrometric means is

PCT/GB2009/050460

smaller than a predetermined threshold.

10. The DNA analysis system according to claim 9,  
wherein

when a maximum ion intensity of a mass spectrum of  
5 the standard sample detected by the mass spectrometric  
means is equal to or higher than the threshold, the sample  
where the maximum ion intensity of the mass spectrum is  
detected as one smaller than the threshold is re-supplied  
to the ionization means by the sampling means.

10 11. The DNA analysis system according to claim 9,  
further comprising:

a plurality of measurement systems, where each of the  
measurement systems comprises the sampling means, the  
ionization means, and the mass spectrometric means, wherein

15 when a maximum ion intensity of a mass spectrum of  
the standard sample detected by mass spectrometric means in  
one measurement system of the plurality of measurement  
systems is smaller than the threshold, the sample where a  
maximum ion intensity is detected as one smaller than the  
20 threshold at the one measurement system is transmitted to  
sampling means of another measurement system except the one  
measurement system.

25 12. The DNA analysis system according to claim 9,  
further comprising:

a plurality of measurement systems, where each of the

measurement systems comprises the sampling means, the ionization means, and the mass spectrometric means, wherein when a maximum ion intensity of a mass spectrum of the standard sample detected by mass spectrometric means in one measurement system of the plurality of measurement systems is smaller than the threshold, a sample intended to be measured by the one measurement system is sent to sampling means of another measurement system except the one measurement system.

10